1 Distributions

Distribution	Moments	Bernoulli	Binomial	Geometric	Poisson	Exponential	Uniform	Normal
PDF		$\theta^x(1-\theta)^{1-x}$	$\binom{n}{k}\theta^k(1-\theta)^{n-k}$	$(1-\theta)^{x-1}\theta$	$e^{-\lambda}\frac{\lambda^x}{x!}$	$\frac{1}{\lambda}e^{\frac{-x}{\lambda}}$	$\frac{1}{b-a}$	$\frac{1}{\sqrt{2\pi\sigma^2}}e^{\frac{-(x-\mu)^2}{2\sigma^2}}$
E[X]	$\bar{X} = \frac{1}{n}\sum_{i=1}^{n} X_i$	θ	$n\theta$	$\frac{1}{\theta}$	λ	λ	$\frac{a+b}{2}$	μ
Var[X]	$E[X^2] = \frac{1}{n}\sum_{i=1}^{n}(X_i - \bar{X})^2$	$\theta(1-\theta)$	$n\theta(1-\theta)$	$\frac{1-\theta}{\theta^2}$	λ	λ^2	$\frac{(b-a)^2}{12}$	σ^2

2 Hypothesis Testing

H_0	H_A	Conditions	Test Statistic	Rejection Region	Degrees of freedom
$\mu_1 = \mu_2$	$\mu_1 < \mu_2$ $\mu_1 > \mu_2$ $\mu_1 \neq \mu_2$	Known σ	$Z = \frac{(\bar{X}_1-\bar{X}_2)-(\mu_1-\mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1}+\frac{\sigma_2^2}{n_2}}}$	$Z < -z_\alpha$ $Z > z_\alpha$ $\lvert Z\rvert > \lvert z_{\alpha/2}\rvert$	
$\mu_1 = \mu_2$	$\mu_1 < \mu_2$ $\mu_1 > \mu_2$ $\mu_1 \neq \mu_2$	Unknown but equal σ $s^2 = \frac{1}{n-1}\sum_{i=1}^{n}(x_i-\bar{x})^2$ $s_p^2 = \frac{(n_1-1)}{(n_1-1)(n_2-1)}s_1^2 + \frac{(n_2-1)}{(n_1-1)(n_2-1)}s_2^2$	$t = \frac{(\bar{X}_1-\bar{X}_2)-(\mu_1-\mu_2)}{\sqrt{{s_p}^2(\frac{1}{n_1}+\frac{1}{n_2})}}$	$t < -t_{df,\alpha}$ $t > t_{df,\alpha}$ $\lvert t\rvert > \lvert t_{df,\alpha/2}\rvert$	$df = n_1 + n_2 - 2$
$\pi_1 = \pi_2$	$\pi_1 < \pi_2$ $\pi_1 > \pi_2$ $\pi_1 \neq \pi_2$	Z-test for proportions	$Z = \frac{(\hat{\pi}_1-\hat{\pi}_2)-(\pi_1-\pi_2)}{\sqrt{\frac{\hat{\pi}_1(1-\hat{\pi}_1)}{n_1}+\frac{\hat{\pi}_2(1-\hat{\pi}_2)}{n_2}}}$	$Z < -z_\alpha$ $Z > z_\alpha$ $\lvert Z\rvert > \lvert z_{\alpha/2}\rvert$	
$\beta_1 = 0$	$\beta_1 \neq 0$	Test for linear relationship	$t = \frac{\hat{\beta}_1-\beta_1}{\sqrt{\frac{s^2}{S_{xx}}}}$	$t > \lvert t_{df,\alpha/2}\rvert$	$df = n - 2$

3 Linear Regression Formulas

$$\hat{\beta}_0 = \bar{y} - \hat{\beta}_1\bar{x} \tag{1}$$

$$\hat{\beta}_1 = \frac{S_{xy}}{S_{xx}} \tag{2}$$

$$S_{xx} = \sum_{i=1}^{n}(x_i - \bar{x})^2 \tag{3}$$

$$S_{xy} = \sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y}) \tag{4}$$

$$SS_{RESID} = \sum_{i=1}^{n}(y_i - \hat{y}) \tag{5}$$

$$RegressionVariance : s^2 = \frac{SS_{RESID}}{n-2} \tag{6}$$

$$NormalEquations : \left\{ \begin{array}{c} \sum_{i=1}^{n}(y_i - \beta_0 - \beta_1 x_i) = 0 \\ \sum_{i=1}^{n}x_i(y_i - \beta_0 - \beta_1 x_i) = 0 \end{array} \right\} \tag{7}$$